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NATIONAL BUREAU OF STANDARDS REPORT

8510

Quarterly Report

on

EVALUATION OF REFRACTORY QUALITIES OF CONCRETES FOR JET AIRCRAFT WARM-UP, POWER CHECK MAINTENANCE APRONS, AND RUNWAYS

BY

J. V. Ryan, E. C. Tuma and W. H. Bettum

NBS

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS

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* NBS Group, Joint Institute for Laboratory Astrophysics at the University of Colorado.

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NBS PROJECT **NBS REPORT**

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Building Research Division

Sponsored by:

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1. Introduction

The purpose of this project is the development of criteria for the fabrication of jet exhaust resistant concretes. Concretes under study are evaluated by exposure to hot gases from a combustion chamber. The combustion chamber delivers these gases at velocities and temperatures approaching field conditions.

2. Present Plan of the Investigation

The experimental work has been completed in the present Fiscal Year. A summary report on the whole project will be prepared promptly in Fiscal Year 1965.

3. Activities

Two sets of specimens were prepared during this quarter, one containing diabase aggregate, the other blast furnace slag. Both sets of specimens were conditioned in the fog room for one week. One-half of each set was oven dried for one week before testing.

3.1 Minimal Conditioning

The curing and drying time was again reduced on two sets of specimens in an attempt to determine the minimum fog-room and oven-drying time required so the specimens would still develop the required strength and resistance to jet impingement. The first set, Di-6, consisted of six 12-in. diameter by 6-in. thick cylindrical specimens plus nine 3 x 4 x 16 in. beams. The cylindrical specimens were instrumented with thermocouples at the surface, 1/8 in., 1/4 in., 3/8 in., and 1/2 in., and with two pressure tubes at 1/2-in. depth. All the specimens in each set were put in the fog room as soon as the forms were removed. At seven days, three cylinders and three beams were put in an oven and heated to 110°C; another three beams were conditioned at 73°F and 50 percent Rh. At the end of the oven drying period (7 days) all six of the cylindrical specimens were exposed to the jet impingement test. The beam specimens were broken in flexure and compressive strength measurements made on the beam ends.

The second set of specimens were made of blast furnace slag aggregate (BF-3), and were conditioned and instrumented in the same manner as the Di-6 specimens described in the first paragraph.

The results are given in Tables 1 & 2.

3.2 Conclusions

The five sets of specimens tested after various times of fog-room curing and accelerated drying show little or no adverse effects in strength or resistance to spalling in comparison to the specimens conventionally cured and dried.

Table 1. Results From Specimens After Short Conditioning Periods

	Oven Dried			Fog Room		
Di-6	12 x 6	Spall Volume	Max. Pressure	12 x 6	Spall Volume	Max Pressure
	No. 1	0	50 psi	No. 2	160 cc	232 psi
	3	0	51 psi	4	150 cc	160 psi
	5	0	54 psi	6	170 cc	236 psi
	Avg.	0	52 psi	Avg.	160 cc	209 psi
BF-3						
	No. 1	0	54 psi	No. 2	130 cc	78 psi
	3	0	36 psi	4	180 cc	224 psi
	5	0	46 psi	6	124 cc	102 psi
	Avg.	0	45 psi	Avg.	145 cc	135 psi

Table 2. Supplementary Tests on Specimens After Short Conditioning Periods.

	Modulus of Rupture, psi		Compressive Strength, psi		Moisture Content, %	
	Avg[a]	Max.	Avg[a]	Max	Avg[a]	Max
Di-6						
Oven Dried	790	820	8690	9060	0	0
73°F/50% Rh	750	790	8910	9140	4.4	4.6
Fog Room	885	910	9370	9420	5.5	5.6
BF-3						
Oven Dried	905	915	8170	8500	0	0
73°F/50% Rh	605	625	7440	8500	5.6	5.9
Fog Room	970	1010	7300	7690	7.1	7.4

a/ Of 3 specimens

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